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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,786	08/03/2004	Min-Lung Huang	11577-US-PA	4785

31561 7590 06/13/2006

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER	
DOLAN, JENNIFER M	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 06/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/710,786	HUANG, MIN-LUNG	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-8 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-8 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 03 August 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Japanese Patent Publication 10-124826 to Chiyokubo.

Chiyokubo discloses a method for enhancing adhesion between a photoresist material and a substrate (paragraphs 0027-0032; 0069-0070) comprising: forming a first photoresist layer (17) over the substrate (figure 6) and forming a second photoresist layer (16b) over the first layer, wherein the second photoresist layer has a higher viscosity than the first layer (paragraphs 0037; 0049-0050).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4 and 6-8 are rejected under 35 U.S.C. 102(e) as anticipated by U.S. Patent No. 6,602,775 to Chen et al. or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chen et al. in view of Japanese Patent Publication 10-124826 to Chiyokubo.

Regarding claims 1 and 6, Chen discloses a bumping process comprising: providing a wafer (10) having a plurality of bonding pads (12) and a passivation layer (14) that exposes the bonding pads; forming a metallic layer (16) over the wafer to cover at least the bonding pads (figure 1); forming a first photoresist layer (18) over the wafer (figure 1); and forming a second photoresist layer (20) over the first photoresist layer; performing an exposure and development process (column 3, lines 5-35) to form a plurality of openings in the first and second photoresist layer that expose the metallic layer (figures 3-5; column 3, lines 35-47); filling a solder material (32) into the openings to form a plurality of solder posts (column 3, lines 47-57; and removing the first and second photoresist layers (column 3, lines 60-67; figure 6). Since Chen discloses that the lower film may be a negative spin coated photoresist (column 2,lines 60-62) and the upper film may be a dry film resist (column 3, lines 4-5), it appears that Chen meets the limitation of the first photoresist film having a smaller viscosity than the second film, and thus satisfies all of the claimed limitations.

In arguendo, however, Chen is silent as to any specific viscosities of the photoresist films.

Chiyokubo teaches that it is desirable to form a two-layer photoresist with a low viscosity, thin lower film and a high viscosity thick upper film (paragraphs 0037; 0049-0050).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Chen, such that the thin, lower resist film has a lower

viscosity than the thick, upper film, as suggested by Chiyokubo. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide a two layer resist with a thin, low-viscosity lower film and a thick, high viscosity upper film, because doing so reduces voids in the lower film and increases planarity of the lower film, thus improving wettability between the lower film and underlying layers (See Chiyokubo, paragraphs 0021, 0028, 0032, 0049-0050, 0069, 0070). It is further appreciated by one skilled in the art that a low-viscosity film would not be capable of forming the 100 micron thick upper photoresist film disclosed in Chen (see column 3, line 1).

Regarding claim 2, Chen discloses performing a reflow process on the solder bump (column 4, lines 8-15).

Regarding claims 3, 4, 7, and 8, Chen discloses that the first and second photoresist films may be dry films (column 2, lines 59-61, column 3, lines 4-6).

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. in view of Chiyokubo, as applied to claim 1 above, and further in view of U.S. Patent No. 6,784,089 to Lei et al.

Chen is silent as to how the solder bump is deposited.

Lei discloses that it is common to form a solder bump in an opening in a photoresist layer through electroplating (column 9, lines 15-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify forming a solder bump through electroplating, as suggested by Lei, in the method of Chen as modified by Chiyokubo. The rationale is as follows: A person having

ordinary skill in the art would have been motivated to use electroplating to form the solder bump, because Lei shows that doing so results in a completely flat upper surface of the bump that is deposited without risk of misalignment (see Lei, column 9, lines 25-35).

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. U.S. Patent Publication No. 2005/0277245 to Ohta et al. discloses a bumping process using a two-layer resist including a liquid resin lower layer and a dry film resin upper layer.

b. U.S. Patent No. 6,649,507 to Chen et al. and U.S. Patent No. 6,372,622 to Tan et al. disclose use of two-layer resists in bumping processes.

c. U.S. Patent Publication No. 2003/0165770 to Lee et al. (esp. paragraph 0029) teaches relationships between photoresist composition, viscosity, achievable thickness of the resist, and uniformity of the resist.

d. U.S. Patent No. 6,335,216 to Yoshida et al. teaches that a low-viscosity lower photoresist film results in excellent planarity and uniformity of the film.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800